

PATENT SPECIFICATION

(11) 1 215 971

1 215 971

NO DRAWINGS

(21) Application No. 1149/68 (22) Filed 8 Jan. 1968

(61) Patent of Addition to No. 1135760 dated 28 Dec. 1965

(45) Complete Specification published 16 Dec. 1970

(51) International Classification B 44 c 3/02 B 32 b 3/26

(52) Index at acceptance

B6J A2

B5N 17Y 189 239 250 253X 254X 270X 273X 287X 290X 295X
300X 301X 303X 304X 308X 371 376 410 41X 42Y 522
540 542 55Y 56X 570 591 620 621 62Y 63X 663 664 666
670 671 679 67X 68X 691 698 69X 755 758 76X 781
783 79Y



(72) Inventors GENE EDWARD GROSHEIM
GEORGE EDWARD POWER

(54) LAMINATE AND PROCESS FOR PREPARING THE SAME

(71) We, FORMICA CORPORATION, a corporation organised under the laws of the State of Delaware, United States of America, of 4614 Spring Grove Avenue, Cincinnati, State of Ohio, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the production of decorative laminates. More particularly this invention is concerned with a modification of the processes for producing decorative laminates with embossed surfaces which form the subject of our Patent No. 1,135,760.

In our earlier Patent we have described how the conventional method for preparing decorative laminates by heat and pressure-consolidating a stacked assembly composed of a number of thermosetting synthetic resin-impregnated core sheets, typically of Kraft paper, and, above the core sheets, a print sheet carrying a printed decorative design and impregnated with a thermosetting resin which in the finished product will be transparent, may be modified in a simple manner to produce an embossed decorative laminate by the use of an "embossing design", by which is meant a raised printed design which will impart a raised surface to the corresponding print sheet. Two alternative processes utilizing such an embossing design are disclosed in the earlier Patent. According to one of these processes there is prepared between two flat metal plates an assembly in stacked relationship of:

- (1) a plurality of thermosetting synthetic resin-impregnated core sheets,
- (2) the embossing design,
- (3) the print sheet,
- (4) a release sheet, and
- (5) cushioning,

after which the assembly is heat- and pressure-consolidated under conditions

which do not deform the embossing design. After removal of the metal plates, cushioning and release sheet at the conclusion of the consolidation step, there is obtained a laminate which has an embossed surface which is, using an analogy derived from photography, a "positive" image of the embossing design. As described in the parent Specification, the embossing design may be formed on the reverse side of the print sheet or it may be formed on a separate sheet.

The second process described in our earlier Patent differs essentially from the first in that the embossing design is positioned on the face of the release sheet remote from the print sheet, rather than between the core sheets and the print sheet. The need for separate cushioning material between the release sheet and the adjacent flat metal plate is avoided according to this second procedure, since the core sheets and print sheet which are to form the laminate provide the cushioning effect necessary to enable the laminate to be deformed on its surface whilst allowing the entire assembly between the flat metal plates to assume the flat surfaces required by the use of flat metal plates. The embossed design which is obtained in this case is the reverse or "negative" of the embossing design, which, of course, does not form a component of the final product. In this instance, the embossing design can be formed on a sheet of paper which is superimposed above the release sheet, or in some cases it can be formed on that surface of the release sheet which is remote from the print sheet.

Several ways in which the embossing design may be printed are described in the parent Specification. Thus, it is suggested that the composition for forming the embossing design may be applied to the appropriate carrier surface by techniques such as hand painting, air brush techniques, spray and stencil techniques and particularly

[Price 5s. 0d. (25p)]

5 silk screen techniques. Solutions or disper-
sions of comparatively high melt thermo-
plastic, thermosetting or thermoset resins are
mentioned as being suitable compositions for
forming the embossing design.

10 We have now discovered in accordance
with this invention that aesthetically appeal-
ing laminates can also be obtained by either
of the processes described in our earlier
Patent when the embossing design comprises
a raised design of hard particulate matter
adhered to a flat carrier surface by means of
an adhesive printed in that design and either
15 (a) the print sheet has a surface of a single
color or (b) the print sheet is replaced by a
decorative sheet which has a surface of a
single color and which is impregnated with
a thermosetting synthetic resin which is
transparent when cured.

20 As was the case with the techniques for
forming the embossing means described in
the parent Specification, the embossing
design of this invention may be formed either
on a separate sheet of paper or on the print
sheet (or decorative sheet) or release sheet,
25 according to which of the two alternative
laminating processes is employed. The
particular carrier sheet selected is printed
with a suitable flat design leaving an adhesive
material in the printed areas. The type of
printing employed depends upon whether or
not the embossing design is to become a
part of the final laminate, produced from the
assembly. Where the embossing design is not
35 to become a part of the final laminate,
the printed flat adhesive design may be
accomplished with a conventional printing
ink which is adhesive until dried and
hardened. Where the embossing design is to
40 become a part of the final laminate, the flat
design must be printed so as to be compatible
with the print sheet. In addition to printing
inks or the vehicles thereof, other adhesive
compositions may be employed. Thus,
45 various resinous materials which produce an
adherent surface as a printed design may be
similarly employed. For example, one can
use thermosetting resins such as melamine-
formaldehyde resins or other triazine resins,
50 urea formaldehyde resins, thiourea-
formaldehyde resins and unsaturated poly-
ester resins, as well as other adhesives such
as various animal and vegetable glues or syn-
thetic contact adhesives such as poly(cyano-
ethyl acrylate). As pointed out above, where
55 necessary, the adhesive will be in a tacky
condition when treated with the particulate
materials described next.

60 Use is next made of small hard particulates
which are forced to adhere to the adhesive
design thereby producing a raised design
substantially immediately after the adhesive
design has been printed and before the
adhesive has had an opportunity to solidify
65 and harden, where this aspect is to be

considered. These small hard particulates
may be any one of a plurality of available
materials such as sand, ground glass, sugar,
salt and finely divided thermoset resinous
materials. In order to achieve the adherence
70 of these small hard particulates to the
adhesive design so as to produce a raised
printed surface, one may print the adhesive
design on the selected sheet such as by a silk
screen printing process, the thus printed sheet
75 is then passed through a zone containing the
hard particulates wherein the partic-
ulates contact the adhesive print and
automatically become bonded thereto.
In those instances where appropriate, the
80 sheet containing the design plus particulates
may next be dried to the thermoset condition.

As has been noted, the print sheet and
decorative sheet are both characterized by
having a surface of a single color, the term
85 "color" including white. In the case of the
print sheets, the colored surfaces are obtained
by a printing process. In this art, the term
"printing" is used rather broadly to denote
any process in which pigment is applied to
90 the surface of a sheet in an accurately
reproducible manner, and therefore includes
techniques such as hand painting and spray-
ing through a stencil, as well as conventional
printing methods such as the silk screen,
95 gravure and thermographic processes. The
decorative sheets differ essentially from the
print sheets only in that the surfaces of a
single color are obtained by means other
than printing. For example a decorative sheet
100 having a white surface can be obtained by the
use of a pigmented paper. Whether a print
sheet or a decorative sheet is employed,
the sheet is impregnated with a thermosetting
resin which is transparent when cured.
105 Suitable, thermosetting synthetic resins in-
clude, for example, melamine-formaldehyde
and other triazine resins, urea-formaldehyde
resins, thiourea-formaldehyde resins and
unsaturated polyester resins. In preparing
the print or decorative sheets, the
110 resin-impregnation step may precede the
application of a colored pigment thereto,
or there may be used a sheet which is
pre-colored.

Apart from the use of an embossing design
which comprises a raised design of hard
particulate matter and, optionally, a deco-
115 rative sheet in place of a print sheet, the
present invention may be carried out by
the techniques described in the parent
Specification, which techniques are in fact
largely conventional.

The invention is illustrated by the Exam-
120 ples which follow.

Example 1

A stack of nine phenolic resin-impregnated
Kraft core sheets are arranged in superim-
posed relationship on a polished steel

plate. Above the Kraft paper sheets there is positioned a solid yellow color melamine resin - impregnated α - cellulose decorative sheet. Above this decorative sheet is positioned a release sheet comprising aluminum foil having bonded to its upper surface a sheet of thin tissue paper onto which circular designs have been printed in flat design after which small hard particulates in the form of common table salt have been adhesively adhered. The adhesive employed was a polydiallyl phthalate resin containing a conventional peroxide polymerization catalyst and said resin was cured to a thermoset condition after application of the particulates. Above the release sheet there is positioned two layers of Kraft paper not impregnated with any resinous material and designed to function as a paper cushion. Thereupon, a second polished plate is placed above the Kraft paper cushions and the entire assembly is subjected to heat and pressure to produce the laminate. After cooling, the assembly is removed from the press and the plates and release sheet including the Kraft paper cushions are removed from the laminate. There is obtained a yellow laminate highlighted by a decorative embossed pattern of circular designs.

Example 2

The procedure of Example 1 was generally followed. The number of Kraft core sheets was reduced to three. The color of the decorative sheet was white obtained by the use of a pigmented paper. The embossing design was incorporated on the back of the decorative sheet. The adhesive was an epoxy resin which was printed in flat design as a series of interconnecting lines forming diamonds of approximately $\frac{9}{64}$ square inch in area. The hard particulates were of sand after their application to the design area, the epoxy resin was cured to the thermoset condition. There was obtained a white laminate highlighted by a decorative embossed pattern of diamond shapes. In this example the embossing design became a part of the laminate formed and the decorative pattern was raised with respect to the surface of the laminate.

Example 3

The procedure of Example 1 was followed. The number of Kraft core sheets was six. The

color of the decorative sheet was red. The embossing design was incorporated as a separate sheet positioned just below the decorative sheet in the laminate assembly. This sheet was impregnated with a melamine resin of the same quality as employed in impregnating the decorative sheet. A flat scroll design was printed upon this sheet with a hot vinyl resin, employing gravure techniques, adding ground glass particulates to the design before the vinyl resin had solidified. There was obtained a red laminate high-lighted by a decorative embossed pattern of scroll design. In this example the embossing design became a part of the laminate formed and the decorative pattern was raised with respect to the surface of the laminate.

WHAT WE CLAIM IS:—

1. The process for producing a decorative laminate defined in Claim 1 or Claim 2 of Patent No. 1,135,760 modified in that the embossing design comprises a raised design of hard particulate matter adhered to a flat carrier surface by means of an adhesive printed in that design, the print sheet leaving a surface of a single color.

2. The process of producing a decorative laminate defined in Claim 1 or Claim 2 of Patent No. 1,135,760 modified in that (a) the embossing design comprises a raised design of hard particulate matter adhered to a flat carrier surface by means of an adhesive printed in that design, and (b) the print sheet is replaced by a decorative sheet which has a surface of a single color and which is impregnated with a thermosetting synthetic resin which is transparent when cured.

3. A process for producing a decorative laminate according to Claim 1 or Claim 2 and substantially as herein before described.

4. A decorative laminate whenever produced by a process according to any preceding claim.

TREGEAR, THIEMANN & BLEACH,
Chartered Patent Agents,
Melbourne House,
Aldwych,
London.
Agents for the Applicants.